

What is claimed is:

1. An apparatus for sensing and reporting a synchronizing event from a diesel engine, comprising:

an engine analyzer with input ports, said analyzer being capable of responding to the signals applied to its input ports;

a transducer to convert a sensed transient physical phenomenon into an electrical signal; and

a signal conditioner to transform the output electrical signal of a transducer into a signal at a level compatible with an input into said engine analyzer.

2. The apparatus of claim 1, where said engine analyzer further comprises:

an input capability comprised of an analog voltage input;

a display feature that displays the equivalent of an oscilloscope waveform in response to a time-variant analog input voltage signal;

a control feature that permits user input of control commands; and

a programmable processing capability permitting application of input signals to result in different responses in accordance with changed operational settings.

3. The apparatus of claim 1, where said transducer further comprises a sensor that responds to a transient change in applied strain by developing a transient output electrical signal.

4. The apparatus of claim 3, where the output electrical signal of said transducer is electrically equivalent to a measurable quantity of electrical charge on a capacitor discharging through a resistance.

5. The apparatus of claim 3, where said transducer further comprises a piezoelectric sensor.

6. The apparatus of claim 3, where said transducer further comprises a sensor that detects the transient pulses characteristic of a diesel engine fuel line carrying fuel from an injector to the port at which that fuel is injected into a cylinder of a diesel-fueled, compression-ignited engine.

7. The apparatus of claim 3, where said transducer further comprises a sensor that detects the transient pulses characteristic of a diesel engine fuel line carrying fuel to an injector.

8. The apparatus of claim 1, where said signal conditioner further comprises:

an electrically powered circuit that performs voltage regulation on the power voltage fed into said signal conditioner.

an electrically powered circuit that accepts an analog input signal from a piezoelectric transducer into said signal conditioner.

9. The apparatus of claim 1, where said signal conditioner further comprises an electrically powered circuit that adjusts the polarity, quiescent

reference voltage level, signal amplitude, and output impedance of an analog input signal to produce an analog output signal proportional to an input signal from a piezoelectric transducer over a range, the output signal further meeting an input level requirement of a unit of test apparatus intended to monitor one or more functions of a fuel-fired reciprocating engine.

10. The apparatus of claim 1, where said engine analyzer further comprises:

- an embedded software sequence permitting a user to identify the properties of an input impinging on a standard input port as corresponding to one of a multiplicity of types of external phenomena;

- an embedded software sequence interpreting a transient electrical signal waveform as a strain signal in a high-pressure fuel line; and

- an embedded software sequence directing a display element of said engine analyzer to display the impinging transient signal as a time-varying voltage function.

11. The apparatus of claim 11, where said engine analyzer further comprises an embedded software sequence directing a storage element of said engine analyzer to record the impinging transient signal as a sequence of sampled voltage elements at a selectable sampling rate.

12. The apparatus of claim 1, where said engine analyzer further comprises an embedded software sequence to evaluate the properties of an input waveform in such fashion as to distinguish between individual amplitude

elements, discriminating between actual fuel rail pulses and such false signals as echoes and reverberations of the line currently under test and coupled signals originating at other locations, whether within the engine under test or not.

13. The apparatus of claim 1, where said engine analyzer further comprises an embedded software sequence that computes and displays engine RPM from the rate of occurrence of detected diesel engine fuel rail pulses.

14. An apparatus for sensing and incorporating a synchronizing event from a diesel engine into an engine analyzer, comprising:

means for sensing transient mechanical strain events in a tube;

means for converting a detected strain event from a mechanical to an electrical phenomenon;

means for amplifying and conditioning an electrical phenomenon into a conventional electrical signal comparable to one normally used to provide an input to a unit of engine test apparatus;

means for recognizing within a unit of engine test apparatus a signal originating from a transient mechanical strain; and

means for displaying within a unit of test apparatus a signal originating from a transient mechanical strain.

15. The apparatus of claim 14, comprising means for storing signals derived from detected transient strain events.

16. The apparatus of claim 14, further comprising:
- means for retrieving detected transient strain event signals from storage;
 - means for arranging retrieved subsets of stored data for display; and
 - means for superimposing multiple retrieved data streams in a single display.
17. The apparatus of claim 14, further comprising:
- means for discriminating between principal transient strain event signals and successive echoes, reverberations, and other false signals; and
 - means for limiting display of signals to principal signals.
18. The apparatus of claim 14, further comprising means for triggering flashes in stroboscopic timing lights.
19. A method for sensing and incorporating a synchronizing event from a diesel engine into an engine analyzer, comprising:
- sensing transient mechanical strain events in a metallic tube carrying motor fuel;
 - converting a detected transient strain event from a mechanical to an electrical phenomenon;
 - adjusting the amplitude and source impedance of a transient electrical phenomenon to correspond to those characteristics as observable in an electrical signal normally used to provide an input to a unit of engine test apparatus.

20. The method of claim 19, further comprising:
- recognizing within a unit of engine test apparatus a signal originating from a transient mechanical strain; and
 - displaying within a unit of test apparatus a signal originating from a transient mechanical strain.
21. The method of claim 19, further comprising:
- storing a signal representing a transient mechanical strain;
 - reformatting a signal representing a transient mechanical strain for display with alternative time base and amplitude representation; and
 - displaying a multiplicity of such stored and reformatted transient mechanical strain signals simultaneously to promote and simplify comparison between such signals.
22. The method of claim 19, further comprising:
- generating an output signal in response to the occurrence of a transient mechanical strain, wherein the output signal is a trigger to a stroboscopic light.